# Sodium Content of Community Water Supplies in California

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■ The amount of sodium ion in water used for ingestion may be critical in effective use of a low sodium dietary regimen. Waters containing not over 20 mg of sodium per liter are provided for in the sodium restricted diets set forth by the American Heart Association. For diets containing more than 500 mg of sodium a day, waters of greater sodium content may be used if proper dietary adjustments are made.

While assessment of the long-term average sodium content of a community water supply is difficult, the determined values for sodium lend to classification within range categories. The larger community water supplies in California are presented within several range categories of sodium content.

The more commonly used water softeners add sodium to water. The sodium-restricted patient should be cautioned against their use. Similar consideration should probably be given to water supplies of retirement communities where the potential for disorders requiring sodium restriction is greater than in the general population.

THE EFFECTIVE USE of sodium restricted diets in the treatment of conditions such as congestive heart failure, hypertension, liver disease or other disease depends upon a critical value of sodium ion in water for ingestion as well as adherence to a diet low in this element. Failure to recognize this may contribute to or result in non-response to sodium restriction.<sup>4</sup>

For several years, the California State Department of Public Health has sampled community

## Sodium in Water Related to Total Sodium Intake

The sodium restricted diets promulgated by the American Heart Association are probably the most widely accepted materials of their kind.<sup>7,8</sup> For the 500-milligram sodium restricted diet, the quantity and variety of foods allowed provide approximately 440 mg of sodium a day. The addi-

water supplies within the state for sodium analysis. These data may not be readily available to the practicing physician. The purpose of this paper is to present this information and to consider briefly some related factors.

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tional 60 mg may derive from water. The average adult intake of water should be about 2.2 liters a day. In order not to exceed the prescribed total of 500 milligrams, water containing not over 20 mg of sodium per liter is indicated for drinking and for cooking.

The 1,000 milligram sodium restricted diet is based on the 500-milligram sodium restricted diet and the use of water with a similarly low sodium content. The additional 500 mg of sodium may be acquired by the addition of one-fourth teaspoon of salt (equivalent to about 500 mg sodium) or by using designated quantities of selected foods which individually or collectively contain 500 mg of sodium. Should the sodium content of water for ingestion be greater than 20 mg per liter, the potential sodium intake from water should be calculated and appropriate adjustments in the diet made. Use of water containing over 250 mg of sodium per liter would contribute more than the additional 500 mg allowed and thus is contraindicated. Because sodium content of community water supplies may fluctuate (for reasons considered below) water supplies containing over 200 mg of sodium per liter should probably also be interdicted.

The assessment of the long-term average sodium content of a community water supply is difficult. There are a number of reasons for this. Among the factors are:

- 1. Natural sources of sodium, such as
  - a. seasonal fluctuations associated with rainfall and runoff.
  - b. leaching from underground sodium salt deposits,
  - c. sea water intrusion in coastal areas,
  - d. ion exchange via earth deposits resulting in replacement of some other element by sodium:
- 2. Artificial sources of sodium, such as
  - a. use of sodium containing salts for purification or softening of water,
  - b. use of brine regenerated zeolite exchange resins in either community or home water softener systems; and
- 3. Capacity and manipulation for distribution of water in the community, as for example:
  - a. the existence of more than one purveyor using more than one water source for the total community, and
  - b. the use, by a single purveyor to the community, of water sources having differing

sodium contents with the delivery of varying blends of water at different times.

These and other considerations outside the scope of this paper have been presented previously.3,9

Of particular importance, especially in hard water areas such as most of Southern California, is the frequent use of softeners for removal of dissolved calcium and magnesium. This may be done either at the community or the home level. The usual softening process (brine regenerated zeolite) substitutes sodium for the elements that cause hardness. For every 100 mg of hardness removed. 50 mg of sodium are added per liter of water. This amount of sodium is additive to the amount present in unsoftened water.

The less common acid regeneration type of softener does not add sodium to the treated water. This type may be recommended for use by persons on a low sodium regimen or for retirement communities where the potential for disorders requiring sodium restriction is greater than in the general population.

## Sodium in California Community Water Supplies

The data reproduced by sodium category in the accompanying tables were determined by either the Sanitation and Radiation Laboratory of the California State Department of Public Health or by the Branch Public Health Laboratory (Los Angeles) by flame photometry. 1,6 In most instances, more than one sample was analyzed for a single community water supply. In all cases, the largest sodium value obtained during the most recent year of sampling since 1951 was used for listing the community within the several sodium content categories (see appendix). The categories were arbitrarily selected so as to conform to the American Heart Association standards. Communities having more than one water purveyor and comparable sodium values are simply listed in the appropriate category. Communities having more than one water purveyor, the supplies of which differed in sodium content, are listed in the appropriate several sodium categories with notation of purveyor identity. Information about water supplies for unlisted communities may be obtained from the water purveyor or the local health department. A recent nationwide survey of sodium ion in water supplies2 included 21 communities in California. Values listed in that survey are comparable to those reported here.

#### Implications for Physician and Patient

When it is essential that a patient restrict his sodium intake, cognizance must be taken of the sodium content of ingested water. The most rigid approach is for the patient to use distilled or deionized bottled water for drinking and cooking. This approach may be necessary in communities having high sodium content in the water supply. Care must be taken to avoid waters which are labeled "spring pure," "spring fresh" or by other similar designation. These labels do not indicate the sodium content. Spring waters should not be used unless the sodium level has been established as being satisfactorily low by analysis.

Use of the community water supply imposes less restriction for the patient and may be allowed in many areas of California. With the data presented here, supplemented by information from the water purveyor, it may be possible to establish that the community water is indeed acceptable for sodium restricted diets. Because of the many uncertainties involved, it may not be as desirable for rigid sodium control as the use of distilled or deionized water.

Farag and Mozar<sup>5</sup> recently demonstrated that subsequent admission to hospital of patients with congestive heart failure was considerably reduced by intensive follow-up services provided by the nutritionist, nurse and health educator. The data presented here should be of value to these disciplines as well as to the physician in counseling patients who need sodium restriction.

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See Appendix California Community Water Supplies by Sodium Content Category



#### APPENDIX

#### California Community Water Supplies by Sodium Content Category

| ≤20 mg/L  | 21-50 mg/L   | 51-100 mg/L  | *201-250 mg/L<br>101-200 mg/L **>250 mg/L   |
|---|--|--|---|
| Alameda<br>Albany<br>Al Tahoe<br>Anderson<br>Arden Manor<br>Arden Park<br>Auburn<br>Azusa   | Alamo Alhambra Alisal Alturas Alviso Aptos Arbuckle Arcadia Arcata Arroyo Grande Athens (Athens Water Co.) Atherton Atwater  | Alvarado Antioch Anza Village Armona Artesia Atascadero Athens (L. A. Co. Water Works Dist. #1)  | Adelanto Agoura Altadena Anaheim Apple Valley Arvin Avalon Avenal Avila*  |
| Baldwin Park (Baldwin Park Co. Water District, Park Water Co. #26, Valley View Mutual Water Co., Warner Acres Tract Mutual Water Co.) Bass Lake Bear Valley Belliflower (Home Garden Mutual Water Co.) Belmont Belwedere Ben Lomond Berkeley Big Bear Big Bear City Biggs Big Pine Black Point Bloomington Boulder Creek Broadmoor Brockway Brookdale Buckeye Burlingame                                | Bakersfield Vicinity (Calimar Water Co., Vaughn Mutual Water Co.) Banning Bassett-Baldwin Park (San Gabriel Valley Water Co.) Baywood Park Beaumont Bellflower (Berlu Water Co.) Bell Gardens (Coast Water Co., Park Water System #3) Big Bear Lake Buena Park (City)  | Bakersfield (Garden Water Corp.) Baldwin Hills Baldwin Park (San Gabriel) Bellflower (Bellflower Mutual Water Co., Peerless Land and Water Co., Somerset Mutual Water Co.) Bishop Borrego Springs Brea Brentwood Buellton Buena Park (Homewood Mutual Water Co.) | Bakersfield (California Water Service Co.) Bakersfield Vicinity (East Niles Community Service) Barstow** Bell Gardens (So. Calif. Water Co.) Benicia Beverly Hills Blythe Boron** Brawley Burbank   |
| Camp Meeker Camp Nelson Carmel Carmel Highlands Carmichael Vicinity (Arden Park Vista Water Maintenance Dist.) Carnelian Bay-Cedar Flat- Panorama Estates Casaloma Cedar Pines Park Chico Chino (Park Water Co., So. Cal. Water Co.) Citrus Heights Vicinity (Royal Oaks Water Co.) Clearlake Highlands Clearlake Park Cloverdale Colfax Colton Corning Corte Madera Cottonwood Crescent City Crestline | Calwa Cambria Campbell Carmel Valley Carmichael (Carmichael Irrigation Dist.) Carmichael Vicinity (Northridge Park Co. Water Dist.) Cathedral City Cayucos Chowchilla Citrus Heights Vicinity (Lincoln Oaks Water Co.) Claremont Clovis Coachella Compton (Richland Farms Mutual Water Co., So. Cal. Water Co., Uehling Water Co.) Compton Vicinity (Central Gardens Water Co.) Cotati Covina Cuesta La Honda Cutler Cypress | Calimesa Cambria Pines Capitola Caruthers Castroville Centerville Ceres Chino (City) Citrus Heights (Citrus Heights Irrigation Dist.) Colusa Corcoran Corralitos Costa Mesa (Costa Mesa Co. Water Dist.) Cudahy Cupertino  | Calabasas Calexico California City Calapatria Camarillo Carlsbad Carpinteria Clayton Coalinga* Commerce Compton (City, Park Water Co.) Concord Contra Costa County Water District Corona* Coronado Costa Mesa (Newport Heights Irrigation Dist.) Costa Mesa Area (Santa Ana Heights Water Co.) Crockett Cucamonga Culver City |

NOTE: Many towns and communities in the list below are served by more than one supplier of water. Hence the so-dium content may vary from one part of the community to another. In such cases the name of the town or community may be listed under several of the classifications of sodium concentration. It is important, in such split communities, to

| ≦20 mg/L   | 21-50 mg/L   | 51-100 mg/L   | *201-250 mg/L<br>101-200 mg/L **>250 mg/L   |
|--|--|---|---|
| Del Monte Fairways Del Paso Manor Donner Lake Dunsmuir Durham  | Danville<br>Delhi<br>Denair<br>Diablo<br>Dinuba<br>Duarte  | Daly City Davis Decoto Dixon Dominguez Dorris Dos Palos Downey  | Delano<br>Desert Hot Springs  |
| East Monterey Edgemar El Cerrito El Dorado El Monte (Farm Mutual Water Co., Rurban Homes Mutual Water Co.) Emeryville Etiwanda   | Earlimart East Cliff Area East Palo Alto East Pasadena Edgemont El Granada Elk Grove El Modena (Orange County Water Works) El Monte (City, Del Rio Mutual Water Co., San Gabriel Valley Water Co.) El Monte-Garvey Elsinore Vicinity (Elsinore Water Dist.) Enterprise Escalon Esparto Eureka (City) Eureka Vicinity (Humboldt Community Service Dist.) Exeter | East San Bernardino Elsinore Vicinity (Elsinore Valley Municipal Water Dist.)                                 | East Bakersfield East Los Angeles, Belvedere El Cajon El Centro El Modeno (Santiago Water Co.) El Rio El Segundo* Elsinore (City) Encinitas Escondido                     |
| Fairfax Fair Oaks Fail River Mills Fallsvale Farmersville Felton Ferndale Fetters Spring Fields Landing Florin Folsom Forest Hill Forestville Vicinity Fort Bragg Foster City Fruitridge Vista | Fernwood Firebaugh Florence Fowler Fresno Fresno Vicinity (Bakman Water Co.) Friendly Acres Fullerton (Lansdowne Water Co.)  | Fontana<br>Freedom<br>Fremont   | Fallbrook Fillmore Flintridge Frazier Park Fullerton (City)   |
| Galt Garberville Gardenland Area Gerber Gilroy Grass Valley Green Valley Gridley   | Garden Grove<br>Garden Grove Vicinity<br>Glen Avon Heights<br>Greenfield<br>Guerneville  | Gardena Vicinity Gardena-Lawndale Vicinity Garden Acres Glendora (Suburban Water Systems) Grover City Gustine | Gardena Glendale Glendora (City) Glen Ellen Goleta Gregory Gardens Guadalupe  |
| Hayfork Healdsburg Vicinity (Fitch Mountain Water Co.) Highway City  | Half Moon Bay & Vicinity<br>Hamilton City<br>Healdsburg (City)<br>Hercules<br>Hesperia   | Hanford<br>Hayward<br>Hemet<br>Highland Park<br>Hillsborough  | Hawthorne Hawthorne Vicinity-Liberty Acres Helix Irrigation District Hermosa Beach - Redondo Beach Hidden Hills Highgrove Highland Hollister Hollister Vicinity Holtville |

| ≦20 mg/L  | 21-50 mg/L   | 51-100 mg/L   | *201-250 mg/L<br>101-200 mg/L **>250 mg/L   |
|---|--|---|---|
|   |  |   | Home Gardens Hope Ranch Huntington Beach** Huntington Park  |
| Idyllwild<br>Idyllwild Vicinity<br>Independence<br>Inyo   | Indio<br>Indio Vicinity<br>Ivanhoe   | Inverness<br>Irvington  | Industry<br>Inglewood*<br>Isleton   |
| Jackson<br>Jamestown  | Joshua Tree  |   |   |
| Kentfield<br>Kerman<br>Kings Beach  | Keyes<br>Kingsburg   | Kernville   | Kagel Canyon*<br>Kennelva   |
| Lake Arrowhead Lake Arrowhead Vicinity Lakeport Lake Tahoe, So. Shore Larkspur La Selva Beach Lincoln Linda Linda Mar Lockford Lone Pine Loomis Loyalton Lucerne  | Lafayette Lakewood (Ideal Petrole- um Co.) La Puente (L. P. Valley County Water Dist.) La Puente Vicinity (Sub- urban Water Systems) La Verne Little Rock Vicinity (Sun Valley Village Water & Improvement Co.) Livingston Lodi Los Banos Los Molinos Los Molinos Los Osos Lynwood Vicinity (Lyn- wood Gardens Mutual Water Co.)                                     | La Habra Heights (L.H.H. Mutual Water Co.) Lakewood (City) Lamont Lancaster La Puente (Cross Water Co., Vallecito Water Co.) Lenwood Little Rock (Little Rock Creek Irrigation Dist.) Little Rock Vicinity (L.A. Co. Water Works Dist.) Loma Linda Lompoc Vicinity Los Alamitos Los Alamos Los Altos Los Angeles Vicinity (Watts) Los Angeles Vicinity (Florence-Graham) Los Gatos Lynwood (City) | La Canada La Crescenta Laguna Beach La Habra (City) Lakeside Vicinity (Riverview Water District) La Mesa La Mirada La Sierra Heights-Arlington Lawndale Lemon Grove Lemoore Liberty Acres (Hawthorne) Lindsay (City)** Lindsay (Lindsay-Strathmore Irrigation Dist.) Livermore* Lomita Lompoc Long Beach* Los Angeles (City)* |
| Madera Mammoth Mariposa Mentone Menlo Park (City) Meyers Mill Valley Mokelumne Hill Monte Vista Mt. Herman Park Mt. Shasta Murphys Area Muscoy (Muscoy Mutual Water Co. #1, San Bernardino Water Utilities Corp.) | Manteca Maramonte Park Marysville Mayfair-Swain Oak Manor (Stockton Vicinity) Mayfair District of Fresno McFarland Meiners Oaks Vicinity (Ventura River Co. Water Dist.) Menlo Park (California Water Service Co.) Merced Midway City Millbrae Mira Loma Miramar Monrovia Montecito Monterey Park Morgan Hill Morro del Mar Mountain View Muscoy (Delmann Water Co.) | Maywood Vicinity Meiners Oaks (Meiners Oak Co. Water Dist.) Menlo Park (O'Connor Tract Co-op Water Co.) Mission San Jose Modesto Vicinity Montclair Montebello (Montebello Land & Water Co., So. Montebello Irrigation Dist.) Monterey Monte Rio Morro Bay  | Malibu** Manhattan Beach Martinez Maywood Maxwell Mendota Modesto (City) Mojave Montebello (Park Water Co., San Gabriel Water Co.) Montrose Moorpark Morongo Valley   |
| Napa<br>Nevada City   | North Sacramento<br>North Sacramento Vicinity  | Newark<br>New Cuyama  | National City-Chula Vista<br>Needles**  |

| ≦20 mg/L  | 21-50 mg/L  | 51-100 mg/L   | *201-250 mg/L<br>**>250 mg/L  |
|---|---|---|---|
| New Monterey Nice North Highlands North Highlands Vicinity Novato   | Norwalk (City, Junior Water Co., County Water Co., Suburban North System)   | Newhall Newman Newport Beach Niles North Long Beach Norwalk (Southern California Water Co. "A" System)  | Newbury Park Niland Norco North Palm Springs Norwalk (Southern California Water Co. "B" System, Park Water Co.) Nuevo-Lakeview  |
| Oakdale<br>Oakland<br>Olivehurst<br>Orinda  | Oceano Orcutt Orosi Oroville Oroville Vicinity  | Oak View Oildale Olive Opal Cliffs Orange Orange Cove Orange Park Acres Oxnard Vicinity (Dempsey Road Mutual Water Co., Vineyard Ave. Acres Mutual Water Co.)                           | Oakley<br>Oceanside<br>Ojai<br>Oleum<br>Ontario<br>Orland*<br>Oxnard (City)   |
| Pacifica Pacific Grove Pacific Manor Palm Desert Palm Desert Vicinity (Coachella Valley Co. Water Dist.) Paradise Paradise Park Pebble Beach Country Club Pine Cove Pinedale Placerville Pleasant Hill (E.B.M.U.D.) Pollack Pines Portola | Palm Desert Vicinity (Palm Desert Community Services Dist.) Palm Springs Paramount Vicinity Parlier Pico Piedmont Pinole Pixley Planada Pleasanton Poplar Porterville Portola Valley Princeton-by-the-Sea       | Pajaro Palm Springs Desert Paramount Pedley-Sparrland Pismo Beach Placentia Port Hueneme  | Pacheco Palmdale Palo Alto Palos Verdes Estates* Pasadena* Paso Robles* Patterson Perris Petaluma Pico-Rivera Piru Pittsburg* Pleasant Hill (California Water Service) Pomona Port Chicago Port Costa |
| Portora   |   | Quartz Hill   |   |
| Rafael Village Rancho Cordova Rancho Cordova Vicinity Redding Redwood City Redwood Estates Rialto Richmond Rio Linda Riverbank Rockaway Beach Rocklin Rohnert Park Ross Running Springs   | Rancho Mirage Red Bluff Redlands Reedley Rodeo Rosemead Roseville Rubidoux  | Randsburg Rivera Systems East & West (Los Angeles Area) Rosamond  | Ramona Rancho Santa Fe Redondo Beach - Hermosa Beach Ridgecrest Riverside Rolling Hills   |
| Running Springs Rutherford  |   |   |   |
| Sacramento Metropolitan<br>Area (Oak Park & Park-<br>way Water Co.)<br>Sacramento Vicinity (Citi-<br>zens Utilities Co., Sacra-<br>mento Co. Water Agency)<br>St. Helena<br>San Anselmo<br>San Carlos<br>San Francisco<br>San Geronimo    | Sacramento (City, Arvin Water Co., Arcade Co. Water Dist.) Sacramento, North (Citizens Utilities Co. of Calif.) Salinas (California Water Service Co.) San Bernardino (City, Baseline Gardens Mutual Water Co.) | Salinas (Pacific Gas & Electric Co.) San Bernardino (East S. B. Co. Water Dist., So. S. B. Co. Water Dist.) San Bruno San Clemente San Jacinto San Joaquin San Jose (S. J. Water Works) | San Diego San Dimas San Fernando San Marino San Miguel Santa Ana (City) Santa Barbara Santa Maria Santa Monica* Santa Paula Vicinity (Limoneira Co.)  |

| ≤20 mg/L   | 21-50 mg/L   | 51-100 mg/L   | *201-250 mg/L<br>101-200 mg/L **>250 mg/L  |
|--|--|---|--|
| San Juan Area of Sacramento San Leandro San Mateo San Rafael Santa Cruz Vicinity (Santa Hacienda Mutual Water Co.) Santa Rosa Sausalito Sharp Park                                       | San Gabriel Sanger San Jose (Great Oaks Water Co., White Brothers) San Juan Bautista San Luis Obispo San Pablo Santa Ana (So. Main Mutual) Santa Clara Santa Cruz (City)   | San Juan Capistrano Santa Fe Springs Santa Paula (S. P. Waterworks) Saratoga Seal Beach Sedco Shafter Sierra Madre Soledad Solvang  | Santa Susana** Santa Susana Knolls Santa Susana Vicinity** Saticoy Saugus Seaside Shoshone** Signal Hill Simi Somis-Las Posas  |
| Shasta Dam Area Sonoma Vicinity (Valley of the Moon Co. Water Dist.) Sonora Springville Stateline Stockton (Park Woods- Lincoln Village, Colonial Heights Maintenance Dist.) Summit City | Santa Maria Vicinity (Santa Maria Public Airport, Tanglewood) Santa Ynez Sea Cliff Sebastopol Selma South Arcadia South Arcadia South Pasadena South San Gabriel Stanton Stinson Beach Stockton Vicinity (Lincoln Village Maintenance Dist.) Sunnymead | Sonoma (City) Soquel South San Francisco Stanford University Strathmore Sunnyvale Sunset Beach Susanville   | South Gate (City, So. Calif. Water Co.) South Whittier Stockton (California Water Service Co.)* Stratford** Susana Knolls  |
| Tahoe Valley Tahoma Talmage Vicinity Terra Bella Thermalito Truckee Tuolumne Twain Harte Twain Harte Vicinity Twin Peaks   | Taft Tara Hills Tehachapi Temple City Temple City Vicinity Thousand Palms Tipton Town & Country of Sacramento Tulare   | Torrance-Wilmington Vicinity (Dominguez Water Dist.) Tracy Trona Tulelake Turlock Tustin Twenty-Nine Palms  | Thousand Oaks Torrance City* Tranquility** Tri-Cities Municipal Water Dist. (San Bernardino)**   |
| Ukiah  |  | Upland  |  |
| Vallejo<br>Vallemar<br>Valley of the Moon Sum-<br>mer Resort Area  | Ventura Vicinity (Ventura<br>River Municipal Water<br>Dist.)<br>Victorville<br>Villa Park<br>Visalia   | Vacaville<br>Vista  | Val Verde** Ventura-San Buenaventura** Verdugo City* Vernon  |
| Walnut Creek Walnut Grove Weaverville Weed West San Bernardino Co. Water District Westview Willits Winton Wrightwood   | Wasco Westminister (City-Tract 3003, Dyke Water Co., Orange Co. Water Works, So. Calif. Water Co.) West Riverside Willowbrook Wilmar Winters Woodlake Woodside Woodside Woodside Highlands Woodville   | Watsonville West Covina Westminister (City) West Sacramento (West Sacramento Water Co.) Whittier (City, Citrus Grove Heights Water Co., Orchard Dale Co. Water District, San Gabriel Valley Water Co.) Willows Woodland | Walnut Park West Sacramento (Washington Water & Light) Wheatland Whittier (Suburban Water System)* Whittier Vicinity (Murphy Ranch Mutual Water Co.) Williams Woodland |
| Yreka  | Yucaipa (San Bernardino<br>Valley Municipal Water<br>Co., Yucaipa Water Co.)<br>Yucca Valley   | Yorba Linda<br>Yuba City<br>Yucaipa (Western Heights<br>Water Co.)  | Yolo   |